

Health & Safety

Worker Health and Safety Branch

Report

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Analysis of The Impact of the Federal Worker Protection Standard and
Recommendations for Improving California's Worker Protection Program
Regarding Field Posting

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Executive Summary

The revised federal Worker Protection Standard (WPS), effective since 1995, was modeled substantially after California's comprehensive worker protection program (1,2,3). Although the California program exceeded the federal standard in several areas, US EPA determined it did not meet certain aspects of the federal standard. California thus adopted regulation changes to implement the federal WPS in California in December of 1996 (4). These regulations became fully effective January 1, 1997.

WPS sets requirements for employers of both pesticide handlers (those who mix, load or apply pesticides) and agricultural workers (those doing hand labor tasks or irrigation). This report summarizes the evaluation of specific requirements for agricultural workers (fieldworkers). One set of requirements is commonly called "notification requirements". These specify that employers prevent fieldworkers' unsafe entry into treated fields by notifying them orally of recent pesticide applications and, if applicable, the number of days during which entry is prohibited (restricted entry intervals or REIs). The REI is intended to allow pesticide residues to dissipate to levels which do not pose a health hazard to workers. In addition to oral warnings, specific crops treated with certain pesticide products are required to be posted with warning signs which prohibit entry for the duration of the REI (field posting). WPS also requires that employers provide workers with hazard communication information, pesticide safety training, personal protective equipment (PPE), decontamination supplies, and emergency medical assistance.

In 1999, the California Department of Pesticide Regulation (DPR), Worker Health and Safety Branch (WH&S) began assessing the worker protection program in response to concerns held by both DPR and worker advocate organizations about the adequacy of notification, field posting, and hazard communication requirements (5). County agricultural commissioners (CACs) and agricultural production groups also participated in this assessment. This report summarizes WH&S' evaluation of the impact of WPS on California regulations and pesticide-related illnesses, evaluates the effectiveness of current field posting requirements, and provides recommendations to improve California's worker protection regulations. The notification and hazard communication components of California's worker protection program will be evaluated in a separate report.

While California's earlier worker protection program (pre-WPS) based requirements for REIs and field posting on product toxicity, the federal WPS based these requirements on the toxicity of the pesticide's active ingredient. As a result, incorporating the federal WPS into California regulation (post-WPS) changed the REI and/or posting requirements for a number of pesticides. WH&S evaluation of California's worker protection regulations identified six pesticides which had less stringent protections post-WPS compared to pre-WPS. For these six pesticides, four illness episodes unrelated to early reentry occurred post-WPS. The underlying cause for three of the four episodes was related to a change in the pre-harvest interval. The cause of the fourth episode was not related to WPS changes. The regulatory changes do not appear to have increased the inherent hazard potential of these six pesticides.

Evaluation of the impacts of WPS on fieldworker pesticide-related illnesses focused on frequency rates by agricultural work task, crop, and pesticide. No WPS-related impacts were found. WH&S also evaluated reentry violations involved in pesticide-related illnesses and probable causes of early reentry. While no WPS-related impacts were identified, irrigation tasks appear to have a greater potential for pesticide-related illness than do other fieldworker tasks. Lack of notification and failure to wear required personal protective equipment were identified as the leading causes of reentry violations. While data for the most recent years (1997 to 1999) show a slight decline in the number of illness related to these two causes, WH&S plans to conduct further study of these issues.

The rate that agricultural civil penalties (fines) were proposed in response to illness episodes involving reentry violations has risen steadily over the nine-year period, from 20 percent in 1991 – 1994, to 53 percent during 1995 – 1996, to 70 percent in 1997 - 1999. During this time, DPR and the CACs have worked together closely to improve communication and program coordination. While we will continue efforts to deal vigorously and consistently with those responsible for reentry violations associated with documented illness, these data signal that DPR and the CACs are committed to fulfilling key health and safety components of their enforcement programs.

WH&S recommendations for improving the worker protection regulations include stricter enforcement of existing regulations, evaluation of compliance with current posting requirements, review of compliance and enforcement actions related to reentry violations, evaluation of the adequacy of CAC enforcement guidelines, training and outreach to improve compliance with current posting requirements, and evaluation of ways to improve field posting sign availability and durability. DPR plans to address these recommendations by the following work plan:

- Fall 2001: Present the findings to the CACs. Emphasize the importance of conducting outreach/training on the notification and posting requirements and enforcing reentry violations.
- Fall 2001: Meet with worker advocate organizations to discuss the findings, and send an enforcement letter to the CACs identifying notification and posting requirements as a high priority for outreach/training and inspection activity.
- Winter 2001: Meet with agricultural production groups to discuss the findings.
- Winter 2001: Develop and distribute compliance assistance materials on notification and posting requirements.
- June 2002: Complete evaluation of notification and hazard communication requirements.
- December 2002: Establish a compliance baseline to determine whether outreach/training and enforcement actions improve compliance trends.
- January – June 2003: Complete evaluation of the impact of the above steps on compliance with notification and posting requirements and/or reduced illnesses associated with reentry violations. Consider regulatory changes if trends remain unchanged.

Acronym Glossary

3 CCR	California Code of Regulations, Title 3, Division 6, which contains the state's worker protection regulations
a.i.	Pesticide active ingredient
ACP	agricultural civil penalty, an enforcement action which DPR and the County Agricultural Commissioners can take in response to violations of 3 CCR and/or the California Food and Agriculture Code
CAC	California County Agricultural Commissioner(s), DPR's local enforcement agents
DPR	California Environmental Protection Agency, Department of Pesticide Regulation
FAC	California Food and Agriculture Code
PISP	Pesticide Illness Surveillance Program, California Department of Pesticide Regulation, Worker Health and Safety Branch
PPE	Personal protective equipment
REI	Restricted entry interval
VN	violation notice, a compliance action which DPR and the CAC can take in response to violations of 3 CCR and/or the California FAC
WH&S	California Department of Pesticide Regulation, Worker Health and Safety Branch
WPS	federal Worker Protection Standard
US EPA	United States Environmental Protection Agency

Introduction

The revised federal Worker Protection Standard (WPS) regulation was issued by the U. S. Environmental Protection Agency (US EPA) in 1992, and became fully effective on January 1, 1995 (1). The WPS was put in place to reduce the occupational risk of pesticide poisonings and injuries among agricultural workers on farms, and in forests, nurseries and greenhouses. The WPS contains requirements for pesticide safety training, notification of pesticide applications, use of personal protective equipment (PPE), decontamination supplies, and emergency medical assistance. The WPS was modeled substantially after California's comprehensive worker protection program (2,3). Although the California program exceeded the federal standard in several areas, US EPA determined it did not meet certain aspects of the federal standard. In December of 1996, California adopted regulation changes to implement the federal WPS in California (4). These became fully effective January 1, 1997.

In 1999, the California Department of Pesticide Regulation (DPR), Worker Health and Safety Branch (WH&S) began assessing the worker protection program in response to concerns held by both DPR and worker advocate organizations about the adequacy of notification, field posting, and hazard communication requirements (5). The assessment effort gained visibility and momentum in 2000, when the California Assembly Agricultural Committee requested that DPR evaluate the adequacy of California's field posting regulations (6).

The US EPA began a national assessment of the WPS program in 2000. DPR participated in the federal stakeholder workshop held in Sacramento in December 2000. In February 2001, the WH&S assessment of the worker protection program was incorporated by amendment into the US EPA/DPR Federal Work Plan as the Pesticide Illness Surveillance Program (PISP) Data

Analysis Project (7). Findings from the WH&S assessment will be shared with the US EPA Office of Pesticide Program representatives working on the national assessment.

This report summarizes WH&S' evaluation of the impact of WPS on California regulations and pesticide-related illnesses and attributes. It also evaluates the effectiveness of current field posting requirements. While the data analyses are specific to California, recommendations for improving the regulations apply to both the California and federal WPS. The WH&S assessment includes the following components:

- Analysis of the impact of WPS on California regulations,
- Analysis of the impact of WPS on pesticide-related illnesses,
- Summary of comments and recommendations from WH&S workshops and meetings with worker advocate organizations, agricultural production stakeholders, and county agricultural commissioners, and
- Recommendations for improving California and federal field posting protections and regulations. (Notification and hazard communication requirements will be evaluated at a later date in a separate report.)

Analysis of the Impact of WPS on California Regulations, 1991 –1999

Background and Definitions

In the 1970's, California adopted worker protection regulations which DPR has expanded and refined in a continual effort to mitigate the hazards of workplace exposure to pesticides (2,3). One program component set longer restricted entry intervals (REIs) than specified on the pesticide product label, following certain pesticide applications. The REI is intended to allow pesticide residues to dissipate to levels which will not pose a health hazard to workers. Thus, most work activities are prohibited during the REI. Permitted activities may be subject to additional restrictions such as maximum time allowed in the treated field or require wearing personal protective equipment (PPE). Another WPS regulatory component, worker notification, required that workers be orally warned of pesticide applications to areas which they were anticipated to enter during an application, or during the REI.

In addition to oral warnings, specific crops treated with certain pesticide products were required to be posted with warning signs for defined time periods following application (field posting). Prior to 1986, "long-term" field posting applied to all crops following application of a pesticide with an REI greater than 7 days. In 1986, California established additional "short-term posting" regulations for 13 crops. This regulation was based on crop-specific factors including illness frequency rates per acre, amount of pesticide applied, type and time periods of hand cultural practices, high numbers of systemic illnesses or dermatitis cases, use of pesticides with a high acute dermal toxicity, and time periods of high pesticide use (8).

Pesticide registrants evaluate every pesticide product as meeting criteria for toxicity category I, II or III (category I is the most toxic) and display the category's corresponding signal words (danger, warning or caution, respectively) on the pesticide label (1). For eight of the thirteen crops, "short-term" field posting was required when any pesticide product in toxicity category I, with an REI of two days or more, was applied (8). The same requirement applied to the remaining five crops following applications from April 15 through harvest. Existing regulations

specifying longer REIs following certain pesticide applications and requiring a minimum one-day REI following applications of pesticide products in toxicity category I were retained. The previous requirement for long-term field posting also remained in effect.

Changes to California Regulations Following WPS

The federal WPS became fully effective in 1995 (1). From 1995 through December 1996, both the WPS and existing California regulations were in effect. The adoption of the federal WPS into California regulation in 1997 expanded prior California restrictions on worker notification, field posting and REIs. Instead of specifying long- or short-term field posting based on pesticide product toxicity, the new regulations based field posting requirements on the toxicity of the pesticide product's active ingredient(s) (a.i.). WPS requires "dual notification" (both oral notification and posted warning signs) of workers following application of a pesticide product whose a.i. meets toxicity category I criteria for acute dermal toxicity, eye irritation effects or skin irritation effects (dermal/eye/skin). As a result, field posting requirements were increased for some pesticides (increased protection pesticides), but reduced for a few toxicity category I products whose a.i. did not meet toxicity category I dermal/eye/skin criteria (reduced protection pesticides). For pesticide applications not subject to dual notification, employers are required to provide workers either oral or posted notification. For all pesticide applications, worker notification was expanded to include any employee likely to be walking within one-quarter mile of the treated field during the application or the REI.

The WPS also established new regulations for REIs, setting these on an interim basis until the scientists completed further evaluation of each pesticide. If a pesticide product contains a single a.i. which meets toxicity category I dermal/eye/skin criteria, then the REI is 48 hours. If, in addition, the a.i. is an organophosphorous ester that inhibits cholinesterase, and is applied outdoors, then the REI is 72 hours. If the pesticide product's single a.i. meets toxicity category II or III dermal/eye/skin criteria, the REI is 24 hours and 12 hours, respectively. Other criteria apply for pesticides containing multiple a.i. As noted above for the impact of WPS on field posting regulations, many REIs increased (enhanced protections), while some were reduced (reduced protections).

Methods

WH&S analyzed the California worker protection regulations pre-WPS (1991 – 1994) and post-WPS (1997 – 1999) to ascertain whether changes in posting, notification and REI resulted in any reduced protections compared to the pre-WPS regulations (2). WH&S examined pesticides previously subject to short-term posting regulations, those with longer REIs than specified on the pesticide product label, organophosphate pesticides, toxicity category I pesticide products, pesticides typically involved in illness episodes, and pesticides among the top 100 used statewide (9 - 14). Pesticide labels on file with DPR were also examined.

Results

Table 1 displays the results of WH&S analyses. The majority of pesticides examined (27 a.i.) had either more restrictions or no change following WPS. However, six pesticides were identified as having reduced protections post-WPS. Methidathion and methomyl now require posting only for REIs greater than 7 days, while prior California short-term posting regulations

Table 1. Restricted Entry Interval (REI) and Posting Requirements Pre-Worker Protection Standard¹ (WPS) vs. Post-WPS

Change ² +/0/-	Active Ingredient ^{3,4}	Toxicity Category		Current 6772(b) specifies crop(s)	OP ChE Inhib ⁷	Restricted Entry Interval		Posting Required ⁸	
		Product Label ⁵	Dermal/ Eye/Skin (a.i.) ⁶			Pre-1995	Post-1995	Pre-1995	Post-1995
+	acephate	II/III	<I	No	Yes	≤1 day	1 day	No	No
+	aldicarb	I	I	No	No	1 day	2 days	No	Yes
0	azinphos-methyl ⁹	I	I	all crops	Yes	≥14 days	≥14 days	Yes	Yes
0	bifenthrin	I	<I	No	No	no products	½ day	no products	No
+	carbofuran	I	I	No	No	1-14 days	2-14 days	Yes, for REI ≥2 days	Yes
0	chlorpyrifos ⁹	II	<I	citrus	Yes	≤2 days	≤2 days	No	No
-	cyfluthrin	I	<I	No	No	1 day	1/2 day	No	No
0	diazinon ⁹	II	<I	>2 crops	Yes	≤5 days	≤5 days	No	No
+/-	dimethoate	I/II/III	<I	No	Yes	≤2 days	2 days	<i>Yes, for Cat. I and REI ≥2 days</i>	<i>No</i>
0	diquat	II	<I	No	No	1 day	1 day	No	No
+	disulfoton	I	I	corn	Yes	2 days	3 days	Yes	Yes
+	endosulfan ⁹	I	I	all crops	No	2 days	2 days	Yes	Yes
+	ethephon	I	I	No	Yes	1 day	3 days	No	Yes
+	fenamiphos	I	<I	No	Yes	1 day	2 days	No	No
+	fenbutatin-oxide	I	<I	flowers	No	1 day	2 days	No	No
0	glyphosate	II/III	<I	No	No	≤½ day	≤½ day	No	No
+	malathion	II/III	<I	>2 crops	Yes	≤1 day	1-3 days	No	No
+	methamidophos	I	I	No	Yes	2 days	3 days	Yes	Yes
-	methidathion⁹	I	<I	citrus	Yes	2-30 days	2-30 days	Yes, for REI ≥2 days	<i>for REI >7 days</i>
+/-	methomyl⁹	I	<I	grapes	No	1-21 days	2-21 days	Yes, for REI ≥2 days	<i>for REI >7 days</i>
+	naled	I	<I	No	Yes	1 day	1-3 days	No	No

Table 1. Restricted Entry Interval (REI) and Posting Requirements Pre-Worker Protection Standard¹ (WPS) vs. Post-WPS, cont.

Change ² +/0/-	Active Ingredient ^{3,4}	Toxicity Category		Current 6772(b) specifies crop(s)	OP ChE Inhib ⁷	Restricted Entry Interval		Posting Required ⁸	
		Product Label ⁵	Dermal/ Eye/Skin (a.i.) ⁶			Pre-1995	Post-1995	Pre-1995	Post-1995
-	oxamyl	I	<I	No	No	≥1 day	2 days	Yes, for REI ≥2 days	No
+	oxydemeton-methyl	II	<I	>2 crops	Yes	1 day	3 days	No	No
0	paraquat	I	<I	No	No	≤ 2 days	≤2 days	No	No
0	parathion-methyl ⁹ (non-encapsulated)	II	<I	>2 crops	Yes	14-21 days	14-21 days	Yes, for REI >7 days	Yes, for REI >7 days
-	phorate⁹	I	<I	corn	Yes	2-7 days	2-7 days	Yes, for REI ≥2 days	No
+	phosmet ⁹	II	<I	>2 crops	Yes	1-5 days	1-5 days	No	No
0	propargite ⁹	I	I	>2 crops	No	3-42 days	3-42 days	Yes	Yes
+	sodium tetrathiocarbamate	I	<I	No	No	2-4 days	4 days	No	Yes
+	sulfotep	I	I	No	Yes	≤ 2 hours	1 – 2 days	No	Yes
+	sulfur ⁹	II/III	<I	grapes	No	≤1-3 days	1 – 3 days	No	No
+	tribufos	I	<I	No	Yes	≥4 days	7 days¹⁰	No	Yes

1 In 1992, labeling provisions were put in place in Title 40 Code of Federal Regulations, part 156; in 1995, regulations were fully implemented in Title 40, Code of Federal Regulations, Part 170

2 Column 1 indicates increased (+), reduced (-) or no change (0) in protection (reentry and posting requirements) since 1995

3 Pesticides with increased protections since 1995 are **shaded**, with the *enhanced protection criteria in bold italic*.

4 Pesticides with reduced protection since 1995 are **bolded**, with the *reduced protection criteria italicized*.

5 A single a.i. may be formulated as several products with different toxicity categories (i.e., II and III)

6 a.i. dermal/eye/skin toxicity category not specified on label. Category I is implied if dual notification is required by label. Otherwise, toxicity category is assumed to be less than I (<I, i.e., II or III)

7 Organophosphorous cholinesterase inhibitor

8 “Yes” for posting requirements pre-1995 was for Toxicity Category I products with an REI of 2 days or more when applied to 13 crops specified in 3 CCR 6776. Post-1995 posting requirements apply 1) when required by label, or 2) for all crops with REIs > 7 days.

9 Indicates current reentry interval restrictions per 3 CCR 6772(b)

10 REI set by permit conditions

required posting for REIs of two days or more. Pre-WPS, oxamyl and phorate were required to be posted for REIs of two days or more; post-WPS, posting was no longer required following any application. The REI for cyfluthrin was reduced from 1 day to ½ day. Dimethoate and methomyl were identified as having both reduced and enhanced protections post-WPS: the minimum REI was increased, but posting was no longer required. For the 12 pesticides currently listed in Title 3, Division 6, California Code of Regulations (3 CCR) at Section 6772(b), restrictions post-WPS do not differ from pre-1995 restrictions (2).

Analysis of the Impact of WPS on Pesticide-Related Illnesses and Attributes

Methods WH&S' Pesticide Illness Surveillance Program (PISP) maintains a database of pesticide-related illnesses and injuries. Medical reports are received from physicians and Workers' Compensation records. Circumstances of exposure are investigated by the local county agricultural commissioner (CAC). The medical records and investigative findings are entered into an illness registry which provides an important resource for evaluating trends in pesticide-related illness. The following definitions and restrictions apply for the PISP data used in analyses for this report (13,14):

1. WH&S selected the years 1991 – 1999 for analyses. These data are examined for three discrete time periods:
 - four years' data prior to the federal WPS (1991 – 1994),
 - two years' data (1995 – 1996) during the transition period between implementation of the federal WPS and adoption of the federal WPS into California regulations. During this time period, the regulated community was subject to both federal WPS and pre-existing California worker protection regulations.
 - three years' data (1997 – 1999) following adoption of the federal WPS into California's worker protection regulations.
2. Data were restricted to agricultural reentry workers exposed to field residues.
3. A PISP case number is assigned for each person exposed to one or more pesticides. The terms "person", "worker" and "case" are used interchangeably in this report.
4. Cases were restricted to those having a "definite" or "probable" relationship to one or more pesticides. "Possible" cases were excluded because their tenuous relationship to pesticide exposure was unsuitable for rigorous cause-and-effect analyses.
5. The basic unit of analysis was illness "episode". An episode can involve a single case or multiple cases.

The following questions drove the data analyses:

1. Did the number or kind of illness episode change following WPS?
2. Was there a change in illnesses related to the six pesticides noted as providing reduced protections post-WPS?
3. Was there a change in illness occurrence related to any particular pesticides or crops?
4. If changes were noted, were they related to the 13 crops for which California had short-term posting regulations pre-WPS?
5. How many episodes were related to early entry violations? Why were fields entered early?
6. Some cases are identified as meeting "priority criteria for human effects", which involves one or more of the following: death, hospitalization for 24 hours or more with treatment rendered, or five or more symptomatic people seeking medical treatment (priority episodes) (15). These serious episodes warrant special attention to determine their causes. Did the nature, number or any other aspect of priority episodes change after WPS?

Results

Analysis of Reduced-Protection Pesticides

Table 1 identified six pesticides with reduced protections post-WPS: cyfluthrin, dimethoate, methidathion, methomyl, oxamyl, and phorate. The reduced protection under WPS for cyfluthrin was a decrease in REI from one day to ½ day. For the other five pesticides, those in toxicity category 1 pre-WPS, application to specific crops required posting for any REI ≥ 2 days. After WPS, the posting requirement for methidathion and methomyl applied to all crops, but only for REIs > 7 days and dimethoate, oxamyl and phorate no longer required posting. We examined the PISP data for episodes involving these six pesticides, restricting analysis to episodes in which these pesticides were determined to be either the primary causal agent or one of several contributing pesticides.

Table 2 summarizes data for episodes related to these six pesticides. Five episodes occurred pre-WPS and eight episodes occurred post-WPS. Altogether, 105 workers were affected. Seven of the 13 episodes involved reentry violations and seven were priority episodes. The small number of episodes involved precluded analysis by task. Methidathion and phorate were not involved in any episodes. Examination of the primary causes for reentry violations included one episode related to violation of posting regulations and three episodes each related to willful ignorance and lack of notification. For those episodes without reentry violations, contributory causes were unknown or related to either odor detection or allergy. The reductions in protection following WPS do not appear to have increased the hazard potential of these six pesticides. There was no increase in the number of episodes related to the WPS.

Table 2. Summary of Illness Episodes 1991 – 1999 with a Definite or Probable Relationship to a Pesticide, and Determined to Involve Six Pesticides¹ with Reduced Protections Post-WPS as Causal or Contributory to the Illness

Active Ingredient	Number of Episodes per Interval			Number of Priority Episodes ²	Number of REI Violations ³
	1991-1994	1995-1996	1997-1999		
Cyfluthrin	0	0	3 ⁴	2	0
Dimethoate	1	1	1	0	3
Methomyl	3 ⁵	1	2 ⁵	4	4
Oxamyl	1	0	0	1	0
Total	5	2	6	7	7

1 No episodes related to methidathion or phorate were found

2 Episodes meet “priority criteria for human effects”, which involves one or more of the following: death, hospitalization for 24 hours or more with treatment rendered, or five or more symptomatic people seeking medical treatment.

3 Restricted entry interval

4 Episodes related to reduction in pre-harvest interval from 150 days to day of harvest (1997) and were unrelated to WPS changes reducing the REI from 1 day to ½ day. Episodes occurred in 1997 with orange harvesters entering treated fields 3 – 11 days post-application.

5 One episode with no reentry violations

Post-WPS, cyfluthrin was identified as the causal agent in three illness episodes, which occurred between 3 and 11 days post-application; the REI is 12 hours. All three episodes occurred in Tulare County in 1997 and no episodes occurred pre-WPS. WH&S conducted two studies in 1997 and determined that a recent change in product registration allowing cyfluthrin applications up to day of harvest, compared to a former pre-harvest interval of 150 days, was the most likely cause of the illness episodes (16,17). Cyfluthrin is currently under re-evaluation (18). Preliminary data suggest that exposures in the three illness episodes exceeded acceptable safe levels.

Analysis of Frequency Rates and Task Distribution

WPS establishes standards for an array of reentry situations by task. Specific criteria are set for field workers, irrigators, nursery workers, greenhouse workers and tractor drivers. Each PISP case was reviewed and categorized by task to evaluate related impacts. Table 3 presents summary statistics by task for PISP episodes, 1991 – 1999. These data are grouped into the three time periods described previously, of pre-WPS (1991 – 1994), the transition years between federal WPS and adoption of the WPS into California regulations (1995 – 1996), and full implementation of WPS into California regulations (1997 – 1999). Since the time periods differ in length, an annual frequency rate, the average number of episodes per year, is presented for overall comparison among intervals.

Table 3. Summary by Task for Number of Pesticide Illness Surveillance Program Episodes (E) Definitely or Probably Related to Pesticides and Involving Agricultural Workers Exposed to Field Residues, 1991 – 1999, and Number of Persons (P) Involved in Each Episode

Task	1991-1994		1995-1996		1997-1999		Totals	
	E	P	E	P	E	P	E	P
Fieldworker	22	63	11	111	22	158	55	332
Greenhouse Worker	6	6	4	4	0	0	10	10
Irrigator	13	18	9	13	4	7	26	38
Nursery Worker	3	3	4	7	1	1	8	11
Tractor Driver	5	5	1	2	1	1	7	8
Grand Totals	49	95	29	137	28	167	106	399
Avg. Episodes/Persons per Year	12	24	15	69	9	56	12	44

Overall annual episode frequency rates ranged from 9 – 15 per year. While 1997 – 1999 shows the lowest rate, a trend cannot be confirmed from these data. During all time periods, fieldworkers had more total illness episodes than did other work tasks and showed no trends. The number of episodes for all tasks other than fieldworker showed a steady decline over time. Overall, fieldworker episodes accounted for approximately 50% of all episodes and 80% of total ill persons exposed to field residues. Irrigators accounted for approximately 25% of all episodes and about 10% of all ill persons. Greenhouse workers, nursery workers and tractor drivers each comprised 6 - 10% of total episodes. As these tasks more typically involved a single individual, they accounted for only a few percent of the total number of ill persons and, combined, represented 7% of all ill persons. Since PISP data identified fieldworkers and irrigators as

having a greater potential for becoming ill compared to greenhouse workers, nursery workers and tractor drivers, these tasks received particular scrutiny in subsequent analyses.

Analysis of Episode Frequency Rates by Crop

To pinpoint potential deficiencies of WPS compared to California's prior regulations, non-reentry violation episodes were evaluated further. Table 4 displays, by work task, the crops associated with each non-reentry violation episode during the three time intervals pre-WPS (1991 – 1994), the transition years of 1995 – 1996, and following adoption of WPS into California regulations (1997 – 1999).

Table 4. Definite and Probable Pesticide-Related Episodes Involving Agricultural Workers Exposed to Field Residues, with No Reentry Violations, by Crop and Task, 1991 - 1999
(Number of Priority Episodes in Parentheses)

Task	Crop ¹	1991-1994	1995-1996	1997-1999	Total
Fieldworker	Apples	0	0	1	1
	Cotton	0	0	1 (1)	1 (1)
	Grapefruit	1 (1)	0	0	1 (1)
	Grapes²	8 (1)	6 (1)	9 (2)	23 (4)
	Mushrooms	1	0	0	1
	Oranges	1 (1)	0	3 ³ (2)	4 (3)
	Peaches	0	1	0	1
	Plums	1 (1)	0	0	1 (1)
	Sugarbeets	1	0	0	1
	Tomatoes,	0	0	1 (1)	1 (1)
	Processing				
Greenhouse Worker	Ornamentals	4 (1)	4	0	8 (1)
Irrigators	Cotton	2	0	0	2
	Open Field	1	0	0	1
	Oranges	0	0	1	1
	Spinach	0	0	1 (1)	1 (1)
Nursery Worker	Celery	0	0	1	1
	Citrus ⁴	0	2 (1)	0	2 (1)
	Ornamentals	2	1	0	3
Tractor Driver	Grapes	2	0	0	2
	Peaches	2	0	0	2
	Tomatoes,	1	0	0	1
	Processing				
Total		26 (5)	13 (2)	17 (6)	59 (13)
Avg. episodes per year		6.5 (1)	7 (1)	6 (2)	6 (1.5)

1 Bolding indicates crop was one of the 13 with posting required pre-1995 for REIs of ≥ 2 days per 3 CCR Section 6776

2 Grape episodes, by year, ranged from 2 – 5. No significant trend noted in examining the annual data by statistical process control.

3 All episodes related to 1997 change in the pre-harvest interval for cyfluthrin

4 Crop not specified

Overall, the average annual illness frequency rate has remained constant across all nine years. Grapes are associated with the largest number of episodes, with 23 occurring in the 9-year period. The apparent 50% increase in episode frequency associated with grapes (8 episodes pre-WPS vs. 15 episodes during the transition years and post-WPS) was analyzed by a statistical process control program (SPC) (19). No significant trend was found. Annually, the number of grape illnesses was within historical variation, with between 2 and 5 episodes occurring each year. Oranges, grapefruit and unspecified citrus account for a total of eight episodes. Five were priority episodes, which involved a total of 85 persons. As discussed earlier in *Analysis of Reduced-Protection Pesticides*, the three post-WPS episodes in orange harvesters were related to cyfluthrin exposure, and were unrelated to WPS changes. Eight episodes were related to ornamental crops in greenhouses; none were priority episodes. No episodes were noted for tractor drivers after 1994.

Analysis of Frequency Rates by Pesticide

For this analysis, the PISP illness data were restricted to episodes in which a specific pesticide was determined to be the primary causal agent. Sixty-four episodes, involving 24 pesticides, met this criteria. No pesticide-specific trends were noted pre- vs. post-WPS. Overall, from 1991 – 1999, 13 pesticides were identified as causal in one episode each, 6 pesticides identified in two episodes each, two identified in 3 episodes each and one pesticide identified in four episodes.

Only propargite (11 episodes, 5 pre-WPS and 6 post-WPS) and sulfur (18 episodes, 9 each pre-WPS and post-WPS) were associated with a significant number of episodes. Seven of these 29 episodes were priority illness episodes which involved a total of 106 workers; the remaining 22 episodes involved one worker each. WH&S has long recognized the potential hazard of these two pesticides and placed more stringent restrictions on their use than required by product labeling. WPS did not change the posting requirements for either propargite or sulfur, but the minimum label REI for sulfur was increased from less than one day to one day. California regulation already required a minimum one-day REI following sulfur applications. Additional sulfur and propargite use restrictions apply in California (3 CCR 6772) (2). WH&S continues to evaluate effective strategies to reduce illnesses related to propargite and sulfur.

Analysis of Priority Episodes

There were a number of episodes included in Table 3 which met priority criteria for human effects (priority episodes) (15). Summary data for the number of priority episodes and persons involved are provided in Table 5. Average annual frequency rates have remained stable over the nine years.

The annual average number of persons involved in priority illness episodes quadrupled during 1995 – 1996 (59 persons/year), compared to 1991 – 1994 (15 persons/year) and fell only slightly in 1997 – 1999 (50 persons/year). Unfortunately, while this increase is notable and disturbing, it is not amenable to further analysis, nor are there any obvious regulatory mitigations. The considerable number of workers who may be affected in a single priority episode underscores the need to continually examine potential solutions to prevent their occurrence. Table 6 provides a breakdown of priority episodes by task and indicates a similar frequency rate for each time period examined.

Table 5. Summary of the Distribution of Priority Episodes, 1991 – 1999
Number of Episodes and Persons for Definite and Probable Pesticide-Related Episodes
Involving Agricultural Workers Exposed to Field Residues

Year	Number of Episodes	Number of Persons
1991	3	12
1992	6	18
1993	2	6
1994	2	26
Sub-total	13	62
Avg. per year	3	15
1995	5	81
1996	5	36
Sub-total	10	117
Avg. per year	5	59
1997	7	96
1998	3	39
1999	2	16
Sub-total	12	151
Avg. per year	4	50
Total	35 ¹	330
Avg. per year	4	37

1 Includes 22 episodes with reentry violations and 13 episodes with no reentry violations.

Table 6. Summary of the Number of Priority Episodes by Task, 1991 – 1999, for Definite and Probable Pesticide-Related Episodes Involving Agricultural Workers Exposed to Field Residues

Task	Number of Episodes/Task			Total
	1991 – 1994	1995 - 1996	1997 - 1999	1991 - 1999
Fieldworker	8	4	11	23
Greenhouse Worker	1	0	0	1
Irrigator	4	3	1	8
Nursery worker	0	2	0	2
Tractor Driver	0	1	0	1
Total	13	10	12	35
Average Frequency (per year, all tasks)	3	5	4	4

Analysis of Reentry Violations and Probable Causes of Early Reentry

WH&S analyzed the types and frequency of reentry violations/early entry restrictions violations pre- and post-WPS to determine why regulations were violated, and to evaluate any impacts WPS may have had on these underlying causes. Table 7 summarizes the overall episode statistics for reentry/early entry restriction violation status, by task, for the three time periods examined, 1991 - 1999. Overall violation frequency rates were similar among all time periods. The greatest variation in frequency rate over time was noted for fieldworker illnesses related to REI violations. The largest decrease was seen in the frequency rate for 1997 – 1999 irrigator illnesses related to REI/early entry restrictions violations. Overall, no discernable impacts were identified due to WPS.

Table 7. Summary Statistics by Task for 106 Illness Episodes 1991 – 1999, for Definite and Probable Pesticide-Related Episodes Involving Agricultural Workers Exposed to Field Residues: Count of Reentry/Early Entry Restrictions Violations¹ (RV), Other Violations² (Other), and No Violations³ (None)

Task	1991 - 1994			1995 - 1996			1997 - 1999			Total
	RV ¹	Other ²	None ³	RV ¹	Other ²	None ³	RV ¹	Other ²	None ³	
Fieldworker	9	1	12	4	0	7	7	3	12	55
Greenhouse Worker	1	1	4	2	0	3	0	0	0	11
Irrigator	9	0	3	9	0	0	2	1	1	25
Nursery Worker	1	0	2	1	0	3	0	0	1	8
Tractor Driver	0	0	5	1	0	0	1	0	0	7
Total by Violation	20	2	26	17	0	13	10	4	14	106
Avg. frequency per year, by violation	5	0.5	6	8	0	7	3	1	5	12

- 1 34 cases with restricted entry interval (REI) or early entry restrictions violations only; 13 cases with multiple violations, including REI or early entry restrictions violations
- 2 Non-REI/non-early entry restrictions violations which contributed to the episode
- 3 No violations found or were non-REI/non-early entry restrictions violations and non-contributory to the episode

Next, we reviewed all case investigations associated with each episode having REI violations to identify probable causes for early field reentry or non-compliance with early entry restrictions. All 47 episodes had a clear relationship to at least one underlying cause; two or more causes were noted for 31 of the 47 episodes (66% of episodes). Six categories of causes were identified; between one and four causes were associated with each episode. A count of 78 causes was noted overall for the 47 episodes. Table 8 displays these data, combined by cause category. The data in the shaded rows (substantial contact, exceeded 1 hour in field) show the specific early entry restriction violation within the broader PISP violation category of “Early Reentry”. They are included to evaluate compliance with WPS early entry restrictions which include prohibiting entry for at least 4 hours following pesticide applications, prohibiting hand labor tasks and substantial contact with treated foliage, requiring specified PPE, and limiting most early entry activities to one hour in 24 hours.

When identified among multiple causes of reentry violations in an episode, posting violations were always considered the primary probable cause. This cause was noted in 8 of the 47

episodes (17%). The number of posting violations was insufficient for further analysis. Lack of notification was noted in 32 of the 47 episodes (68%) and was the most frequent probable cause of early entry violations both overall and within each time period. In these 32 episodes, lack of notification was noted as either secondary to posting violations or as the primary cause of reentry violations. Lack of notification was followed in frequency by “failure to wear required PPE”, which was associated with 26 of the 47 episodes (55%). This cause was noted as either the sole cause or when workers failed to wear required PPE due to lack of notification, posting violations and/or willful ignorance. Lack of hazard communication, while not a probable cause of early entry, was noted in 5 of the 47 episodes (11%) as secondary to either lack of notification (4 episodes) or failure to wear PPE (1 episode).

Overall, for the most recent time period, 1997 – 1999, it appears there is a decline in the number of episodes associated with both “lack of notification” and “failure to wear PPE”. However, WH&S is concerned about the number of episodes associated with these violations. Notification and hazard communication issues will be evaluated in subsequent WH&S analyses. Similarly, episodes noted as violating early entry restrictions for “substantial contact” or “exceeding 1 hour in field” should continue to be tracked to assess both their frequency and their potential impacts on fieldworker illnesses.

Table 8. Combined Totals for Probable Causes of 47 Illness Episodes with Reentry Violations, 1991 – 1999, for Definite and Probable Pesticide-Related Episodes Involving Agricultural Workers Exposed to Field Residues

Probable Cause ¹	Number of Episodes		
	1991 – 1994	1995 – 1996	1997 – 1999
Lack of Notification	12	13	7
Failure to Wear PPE ²	9	12	5
Posting Violation	2	4	2
Willful Ignorance ³	4	0	1
Hazard Communication ⁴	2	3	0
Sent Worker into Posted Field ⁵	1	0	1
Average Causes per Year	7.5	16	5.5
Total Episodes with Reentry Violations	20	17	10
Early Entry Restriction Violations⁶			
Substantial Contact ⁷	4	4	1
Exceeded 1 hour in field ⁸	not applicable	2	1

- 1 Identified by author's review of case investigations; data not available in PISP
- 2 Failure to wear PPE violated either early entry restrictions or was secondary to notification, willful ignorance, and/or posting violations.
- 3 Worker was aware of the regulations and/or restrictions, but chose to ignore them.
- 4 Not a probable cause; noted secondary to lack of notification or failure to wear PPE
- 5 Employer was aware of treated field and restrictions and ordered worker to enter the field in violation of FAC section 12984 (20).
- 6 Shaded rows not included in cause counts but were noted as causes for over-exposure subsequent to reentry violation.
- 7 Violations of any of the early entry restrictions, which include waiting at least 4 hours after a pesticide application, prohibition of hand labor activities and other substantial contact with treated surfaces, requiring specified PPE, and limit most early entry activities to one hour in 24 hours. This cause was noted in 5 irrigator episodes, 3 fieldworker episodes and 1 tractor driver episode.
- 8 All workers were performing early entry irrigation tasks.

Table 9 summarizes the compliance (Violation Notice (VN); infraction documentation) and enforcement actions (Agricultural Civil Penalties (ACPs); fines) taken in response to illness episodes associated with reentry violations, 1991 – 1999, including priority episodes (15, 21). Overall, there was a slight increase in the rate that county agricultural commissioners (CACs) took such actions.

In particular, the rate that ACPs were proposed in response to episodes has risen steadily over the nine-year period, from 20% in 1991 – 1994, to 53% during 1995 – 1996, to 70% in 1997 - 1999. During this time, DPR and the CACs have worked together closely to improve communication and program coordination. These data signal that the CACs and DPR have been increasingly successful in fulfilling key health and safety components of their enforcement programs.

However, efforts to deal vigorously and consistently with those responsible for reentry violations associated with documented illness can be improved. Overall, from 1991 – 1999, VNs were issued more frequently than were ACPs, with a total of 20 ACPs issued for the 47 illness episodes (43%). Illnesses associated with reentry violations demonstrate the serious human health consequences of pesticide over-exposure. Under the Enforcement Guidelines established late in 1994, such illnesses are considered grave violations of the worker safety regulations and those responsible face an automatic penalty (22). The Enforcement Guidelines’ effectiveness is demonstrated by the increased frequency of enforcement actions taken in response to illnesses related to REI violations. This analysis focused only on those episodes with the highest assurance that the illness was associated with pesticide exposure. That ACPs are not consistently proposed for all such violations indicates that DPR must continue their efforts to implement key health and safety components of its enforcement program.

Table 9. Number of Compliance and Enforcement Actions Taken in Response to 47 Illness Episodes with Reentry Violations Which Involved Agricultural Workers Exposed to Field Residues, 1991 – 1999, and (Number of Priority Episodes)

Compliance/Enforcement Actions Taken	Number of Compliance/Enforcement Actions ¹		
	1991 – 1994	1995 - 1996	1997 - 1999
Agricultural Civil Penalty (ACP)	4 (2)	9 (4)	7 (4)
Violation Notice (VN)	15 (5)	8 (4)	4 (2)
Total Actions Taken	19	17	11
Unknown Action Taken (records unavailable)	1 (0)	0	0
No Action Taken	0	2 (1)	1 (0)
<i>Total episodes with reentry violations</i>	<i>20</i>	<i>17</i>	<i>10</i>
<i>Rate of enforcement actions taken per total episodes in each time period (%)</i>	<i>20%</i>	<i>53%</i>	<i>70%</i>

1 Compliance Action = Violation Notice (VN); Enforcement Action = Agricultural Civil Penalty (ACP). Some episodes resulted in both VN(s) and ACP(s).

Summary of Meetings and Workshops with Farmworker Advocate Organizations, CACs, California Legislature, Representatives of the Agricultural Production Community and US EPA

In 1999, Californians for Pesticide Reform issued a report (“Fields of Poison”) critical of DPR and CAC pesticide enforcement (23). In response, DPR met with many worker advocate organizations in July 1999 to discuss pesticide enforcement and safety-related issues which impact farmworkers (5). The farmworker advocates identified several worker health and safety program improvements for DPR to consider. DPR agreed to focus its efforts on the review of posting, notification, and hazard communication requirements. At a subsequent meeting in November 1999, the advocate organizations provided DPR with recommended modifications to these requirements. In February and March 2000, DPR attended five regional CAC meetings to discuss the farmworker advocate recommendations and obtain input. A summary of the CAC comments was shared at the May 2000, California Agricultural Commissioners and Sealers

association (CACASA) conference. Summaries of worker advocate and CAC comments are provided below.

In February 2000, Senate Bill 1523 (Figueroa), sponsored by farmworker advocates, was introduced. The bill proposed changes to the field posting requirements. DPR staff conducted several queries of pesticide-related illness data for grower and farmworker advocate organizations. DPR and CACs coordinated a field tour for persons interested in the posting bill. CACs testified at the hearing. The bill was later defeated.

In December 2000, at the request of the Assembly Agriculture Committee, DPR met with Senator Figueroa's staff to discuss field posting regulations and legislation (6). DPR agreed to evaluate the field posting regulations to determine if these requirements were adequate. Notification and hazard communication requirements will be evaluated at a later date.

In October 2000, DPR met with agricultural groups and CAC representatives regarding possible changes to the field posting, notification, and hazard communication requirements. Participants recommended that DPR hold meetings in several areas of the state to obtain input from agricultural production stakeholders. WH&S and CACs held two workshops with members of the agricultural production community in February 2001. Meetings were held in Monterey and Fresno counties to learn more about their systems for complying with WPS field posting, notification, and hazard communication requirements and to solicit their recommendations for improvements. A diverse group of about 25 participants attended each workshop, representing growers, pest control businesses, labor contractors, packer/shippers, and pest control advisors.

The US EPA began a national assessment of the WPS program in 2000. DPR attended the first workshop in June and a second workshop in December. In February 2001, the WH&S assessment of the worker protection program was incorporated by amendment into the US EPA/DPR Federal Work Plan as the Pesticide Illness Surveillance Program (PISP) Data Analysis Project (7). Findings from the WH&S assessment will be shared with the US EPA Office of Pesticide Program representatives working on the national assessment.

Summary of Recommendations on Posting Requirements from Farmworker Advocate Organizations

1. Field posting should be required for all pesticide applications and REIs of any length.
2. Increase the number of inspectors assigned to enforce compliance with field posting requirements.
3. Instead of the current system consisting of different signs for short-term vs. long-term posting, there should be a single standardized posting sign for all applications to include the skull and crossbones, "DANGER/PELIGRO", the date of application, the expiration of the REI, the name and phone number of the applicator, and specific health hazards.
4. Growers should ensure signs are visible and properly posted.
5. The sign should be easy to read from a distance and be at least 1½ feet by 2 feet in size.
6. Signs should be posted every 30 feet instead of the current requirement for every 600 feet.
7. There should be mandatory fines for all posting violations.
8. Farm operators should be held responsible for any violations because they have overall control over all work conducted on the property they manage.

9. Signs should be removed immediately when the REI is over instead within the current three days permitted.

Summary of CAC Response (*in italics*) to Farmworker Advocate Organizations' Recommendations on Posting Requirements

1. Field posting should be required for all pesticide applications and REIs of any length.
 - *The benefit of increasing the workload so dramatically is not clear. DPR should analyze illness and compliance data related to posting violations and distribute their findings to the counties. If a problem currently exists, it must be fully documented. Without information on problems or trends, modifications are not justified.*
 - *Cost/benefit analysis should be conducted prior to implementing additional requirements.*
 - *Universal posting would dilute the current warning system for a true, immediate hazard, to merely an informational sign for hazard communication. (Similar to the ubiquitous warnings mandated by Proposition 65).*
 - *Mistakes that currently happen based on incorrect information would not be prevented.*
 - *Agricultural production takes place in open, unfenced and unattended rural areas. Posting each field with application history would be very vulnerable to vandalism, and difficult to establish and monitor.*
 - *Require posting for all crops which are high-intensity hand labor (peaches, grapes, vine seed, etc.) and for crops in which a high number of illnesses occur.*
2. Increase the number of inspectors assigned to enforce compliance with field posting requirements.
Increasing resources for enforcement would help. The prioritization plan should address the priority of posting enforcement.
3. Instead of the current system consisting of different signs for short-term vs. long-term posting, there should be a single standardized posting sign for all applications to include the skull and crossbones, "DANGER/PELIGRO", the date of application, the expiration of the REI, the name and phone number of the applicator, and specific health hazards.
This information, except for specific health hazards, might be a good idea. Listing specific health hazards should not be necessary since posting is intended to prevent entry and there should be no health hazards following expiration of the REI.
4. Growers should ensure signs are visible and properly posted.
5. The sign should be easy to read from a distance and be at least 1½ feet by 2 feet in size.
 - *Current regulations require readability.*
6. Signs should be posted every 30 feet instead of the current requirement for every 600 feet.
 - *Increasing the frequency of signs to less than 600 feet will dilute the impact as warnings.*
 - *Current requirement is sufficient to meet the intent to provide a warning to anyone who might enter.*
7. There should be mandatory fines for all posting violations.
 - *Mandatory fines would create an adversarial atmosphere where education and cooperation could fail.*

8. Farm operators should be held responsible for any violations because they have overall control over all work conducted on the property they manage.
 - *Farm operators currently share employer responsibility with the farm labor contractor if they perform any employer functions such as providing supervision or instruction.*
9. Signs should be removed immediately when the REI is over instead within the current three days permitted (2).
 - *It should be a serious violation (fine of \$401 – \$1,000) if posting signs are not removed within three days after expiration of the REI as required by regulation.*

Summary of Comments from DPR Workshops with Agricultural Production Stakeholders

Early in 2001, WH&S and CACs held two workshops with members of the agricultural production community in Monterey and Fresno counties to learn more about their systems for complying with posting requirements, and to solicit their recommendations for improving these requirements. These counties were selected because they are foremost among agricultural production regions in the state and because they differ widely in both their cropping patterns and their posting regulations. Fresno County, in the middle of California's Central Valley, grows alfalfa, cotton, citrus, and orchard, vine, and row crops. Generally, fields are large, rarely smaller than 20 acres, and can range from several hundred to over a thousand acres in size. Fresno County does not have posting regulations separate from those mandated in state regulations. Monterey County is coastal, the climate is cool and moist and crops can be grown nearly year-round. Monterey grows cole crops, lettuce, artichokes, strawberries, greenhouse crops, carrots, and celery. Fields are typically smaller than in Fresno County and may be only five to twenty acres in size. Often, small adjacent plots are owned by different growers, rather than large contiguous fields being operated by one grower, as is the pattern in Fresno County. In Monterey County, the close proximity of different crops, each requiring diverse pest control and cultivation techniques, contributed to a series of fieldworker illnesses in the late 1970s and early 1980s. In response to these episodes, Monterey County developed its own "24-hour posting" regulation in 1983, which is more stringent than that required by state regulation (24). In Monterey County, posting prohibiting field entry is required for all pesticide applications (except for sulfur) to crop foliage that have an REI of 24 hours or longer. This regulation was successful in drastically reducing the occurrence of pesticide-related illnesses in Monterey County.

WH&S wanted to hear from both of these regions in order to fully understand how the field posting systems were working throughout the state. A diverse group of about 25 participants attended each workshop, representing growers, pest control businesses, labor contractors, packer/shippers, and pest control advisors. Discussion focused on field posting, notification and hazard communication regulations. This report focuses only on the discussion of field posting requirements.

Posting: All participants strongly believe that field posting prevents workers from early reentry. Monterey County participants support their 24-hour posting regulations, even though compliance is costly, because field posting prevents both application and reentry errors.

Participants' Problems Complying with Posting Requirements (primarily from Fresno County)

- Warning signs are not durable and do not withstand weather, irrigation, and use around farming equipment.

- It is difficult to identify posted sub-plots within a field (e.g., lettuce varieties).
- Signs are not always delivered with the pesticide product.
- Every 600 feet is too frequent; too many warning signs dilute the message.
- While warning signs work, they are time-consuming and costly to put up and remove.
- Application re-scheduling and communication delays and breakdowns can lead to fields not being properly posted and fields being entered early.
- Requiring posting for sulfur applications would result in grapes being permanently posted, diluting the intended warning.

Participants' Suggested Improvements to Posting Requirements

- Require signs be plastic or metal.
- Require signs be delivered with the product.
- Reduce the number of warning signs to field corners and entry points only or one central location per field. Workers are already trained to look for the signs.
- Make applicators, not growers, responsible for posting signs.

WH&S Recommendations

Issue 1: *Identify and evaluate the impact of any reduced-protection pesticides post-WPS.*

Findings: *Six pesticides were identified, no impacts were found.*

Recommendation: *No change is needed.*

WPS enhanced minimum notification requirements for all pesticides by mandating oral or posted notification of all applications for all workers anticipated to walk within one-quarter mile of the treated field. For the majority of pesticides, protections were enhanced due to longer REIs or expanded field posting requirements. However, WH&S evaluation of the WPS regulations identified six pesticides (cyfluthrin, dimethoate, methidathion, methomyl, oxamyl, and phorate) as having potentially reduced protections compared to California's pre-1995 short-term posting regulations. WPS either eliminated the posting requirement, increased the time interval which triggers posting (i.e., from 2 days to more than 7 days), or reduced the REI for the six pesticides. Analysis of PISP illness episode data did not demonstrate increased hazard for these six pesticides resulting from WPS-related regulation changes.

Issue 2: *Evaluate and identify trends in PISP data which indicate WPS-related effects on illness frequency rate.*

Findings: *No impacts were found.*

Recommendation: *No change is needed.*

Illness frequency rates were similar pre- vs. post-WPS: episodes were similar in number and by task, crop and pesticide, priority episodes occurred within historical frequency and were distributed similarly to overall frequency rates, and violations occurred with similar frequency. While no WPS-related impacts were found, irrigators appeared to stand out over all three time periods as having a greater potential for illness. Irrigators accounted for 25% of all episodes and a similar percentage of all priority episodes, with a decline noted only during 1997 – 1999 for episodes related to REI violations. WH&S should conduct studies and/or further data analyses to evaluate irrigator exposure and activities.

Issue 3: *Identify the probable causes of reentry violations; propose appropriate mitigations.*

Findings: *Multiple causes for early reentry/early entry restriction violations applied in 66% of episodes (31 of 47 episodes). Lack of notification (68% of episodes) and failure to wear required PPE (55% of episodes) were identified as the most frequent causes. Posting violations occurred in 17% of the episodes. Hazard communication violations occurred in 11% of the episodes but always secondary to either notification, PPE, posting or willful ignorance.*

Recommendations

- *No regulatory change is needed at this time. No WPS-related changes were noted in frequency rate for posting violations or other types of reentry violations. The frequency of posting violations accounts for a small, stable percentage of the probable causes of illnesses related to reentry violations (17%). The number of cases was too small for further analysis (a total of 8 episodes or an average of 1 episode per year). Failure to wear required PPE and lack of notification were far more commonly associated with reentry violations (combined, they comprised 74% of all probable causes) and present a larger problem than do field posting violations. Recent data indicates that this situation may be improving. While overall frequency rates for illnesses related to reentry violations have remained stable, illness frequency rates related to lack of notification and failure to wear required PPE have declined. WH&S evaluation of reentry violations contributory to illness does not support DPR expanding posting requirements at this time. Recommendations may be proposed pending WH&S' evaluation of notification and hazard communication requirements.*
- *DPR should continue to provide guidance to ensure appropriate and consistent enforcement actions are taken. The CAC should continue the current trend to take enforcement action for reentry violations that result in illness. DPR and the CACs should evaluate existing Enforcement Guidelines for proposing penalties in response to re-entry violations, and identify and strengthen sections that do not currently provide the CAC with sufficient guidance (20). While the overall frequency rate for illnesses related to reentry violations has declined in the most recent time period evaluated (1997 – 1999), reentry violations still occur. Stricter enforcement of existing regulations and requirements is anticipated to reduce their occurrence and should be undertaken prior to adopting more restrictive regulations (2).*
- *Subsequent to the above evaluation, DPR should review compliance and enforcement actions and assess impacts on illness frequency related to reentry violations.*
- *DPR should evaluate current compliance with the requirement to remove posting signs within three days of the expiration of the REI. If low compliance is identified, DPR and the CACs should develop and implement plans to improve compliance.*
- *DPR and CACs should conduct focused training sessions on the requirements for field posting and field reentry following pesticide applications. DPR should consider this option when making recommendations subsequent to conducting analysis of the notification and hazard communication components of the WPS and California programs.*

Issue 4: *Evaluate expanding field posting to all pesticides and restricted entry intervals of any length as an improvement to the current field posting requirements.*

Findings: *Data indicate that current posting requirements are effective in preventing workers from entering fields early. Violations are due to failure to post, not failure to obey the posted warning. Failure to post required warning signs was the probable cause of reentry violations in 17% of 47 episodes occurring, on average, once per year. Lack of notification was the most frequent cause, identified in 68% of episodes with reentry violations and frequently contributed to failure to wear required PPE (a cause in 55% of episodes with reentry violations).*

Recommendations

- *No regulatory change is needed at this time. While expanding posting requirements is a mitigation option, lack of notification was far more frequently identified as causing reentry violations which resulted in illness. Since improving the notification process may also reduce posting violations, a thorough evaluation of the notification requirements is needed before adopting this option. WH&S has begun its evaluation, which includes assessing where breakdowns in the notification process occur and which workers may be most affected. The evaluation will guide our recommendations for improving the notification requirements.*
- *DPR should evaluate ways to increase enforcement of current posting requirements, including increasing resources for enforcement and addressing the priority of posting enforcement.*

Issue 5: *Identify and evaluate problems in complying with posting requirements.*

Findings: *The agricultural community reports problems with sign availability, durability, labor costs, too frequent spacing, and difficulty in identifying treated sub-plots. Farmworker advocates support a single standardized field posting sign for all pesticide applications, immediate removal when the REI expires, and signs posted more frequently than every 600 feet.*

Recommendations

- *Data from this evaluation are inadequate to support expanding the information required on posting signs or to post signs closer than every 600 feet. This issue of expanding information on the sign will be addressed further in DPR's evaluation of the hazard communication requirements.*
- *DPR and CACs should evaluate ways to ensure that posting signs are durable and available and adopt the most appropriate strategies to enforce compliance with requirements. Potential means to accomplish this may include the following:*
 - *During inspections, focus on compliance with current regulations in 3 CCR, Section 6776, which require signs remain readable and legible for the duration of the REI.*
 - *Evaluate whether adding the application date to the long-term posting signs would assist inspectors in assessing compliance with posting requirements.*
 - *Amend appropriate portions of 3 CCR, Section 6776, to require signs be either "durable" and/or "remain intact" throughout the posting interval. This would not preclude use of cardboard signs, provided they remained intact and legible. However, it may encourage greater availability and use of plastic and metal signs.*
 - *Work with the agricultural community, industry, university and/or US EPA to develop durable, standardized posting systems, addressing components such as signs, supports and hardware.*
- *DPR and CACs should provide guidance to the agricultural community on posting treated sub-plots, such as lettuce varieties, to clearly identify the treated area. Guidance may consist of an Enforcement Letter, outreach training, and/or other appropriate method.*

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